



## Body Repair Tech Note: Disconnecting 12V and High Voltage Power

Body Repair Tech Notes provide information about Tesla-approved methods and practices for body repair. These instructions assume knowledge of motor vehicle and high voltage electrical component repairs, and should only be executed by trained professionals. Tesla Motors assumes no liability for injury or property damage due to a failure to properly follow these instructions or for repairs attempted by unqualified individuals.





## Introduction

**Disconnect the 12V and high voltage systems to make the vehicle safe to work on before any repair that involves:**

- Welding on the vehicle
- Disconnecting or repairing 12V components
- Touching high voltage components
- Touching supplemental restraint system (SRS) components
- Working near exposed high voltage components
- Storing the vehicle for three weeks or more (unless it is plugged in)

**⚠ WARNING:** Do not assume that the high voltage system is de-energized after 12V power and high voltage power have been disconnected. To avoid the risk of electric shock, always [check for high voltage](#) before proceeding with any repairs that involve contact with high voltage components.

**⚠ WARNING:** Use test probes that are thin enough to fit into the testing ports (less than 10-1/2 mm in diameter) and long enough to make contact with the terminals (at least 45 mm). The Fluke TP38, the Fluke TP80, and the Reed FC-170A are all suitable test probes.



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## Location of High Voltage Components and Cables

### What does the high voltage system consist of?

The high voltage system consists of the High Voltage (HV) Battery and components that contain high voltage circuits, such as the charge port, the drive unit(s), the A/C compressor, and the PTC heater (cabin heater). Some of the high voltage components are contained within the penthouse (the enclosure underneath the 2nd row seat cushion).

### How do you tell which components and cables are high voltage and where they're located?

All high voltage components have a high voltage warning label on them. Many high voltage components also have the color orange associated with them, but not all do.

All high voltage cables are orange.

Before beginning a repair, use the associated diagram to determine whether the repair might involve contact with high voltage components.

### How do you disconnect high voltage power?

[Release the high voltage controller harness connector](#) to disconnect high voltage power.

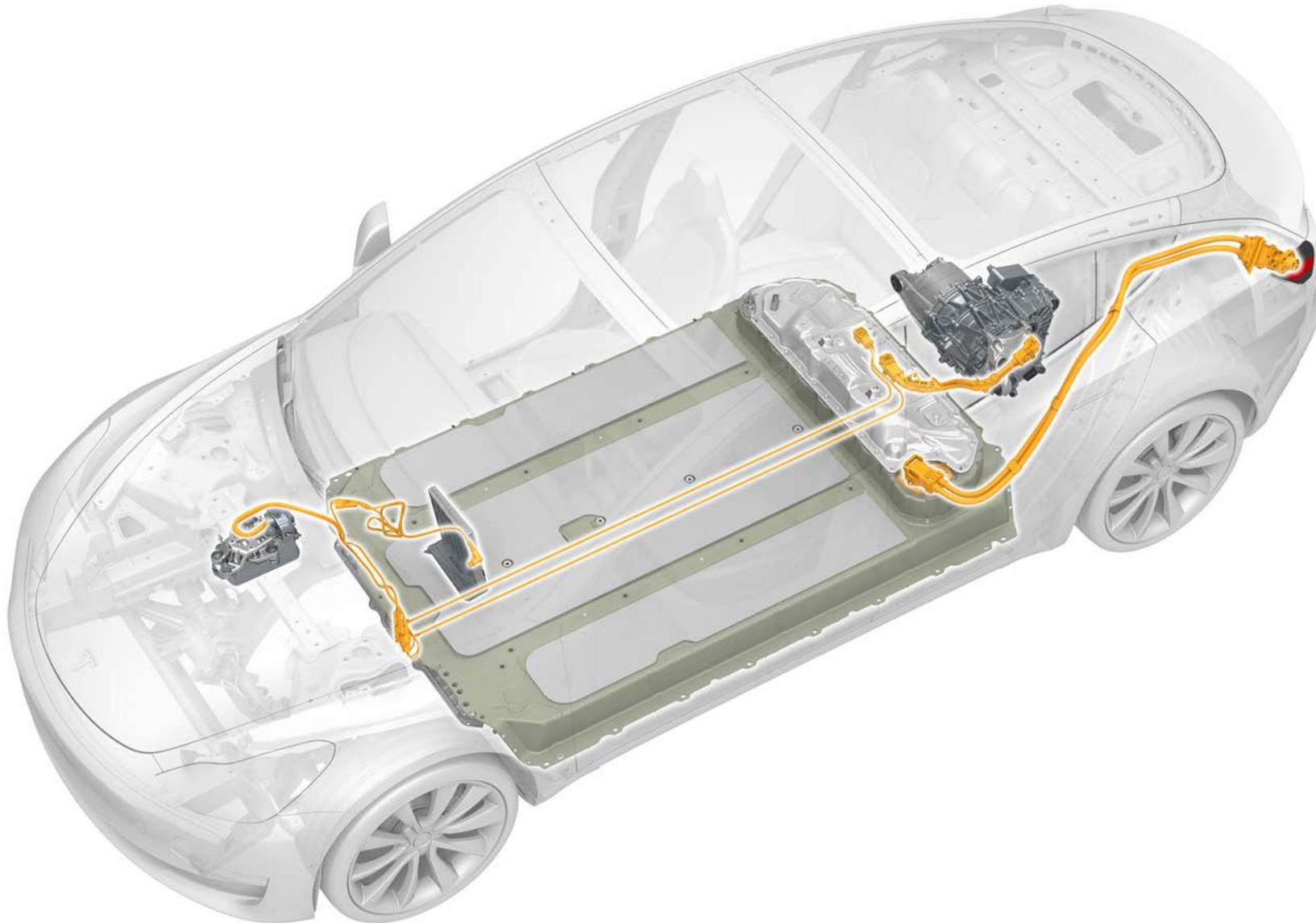
Certain failure modes can allow high voltage power to continue to be present even after high voltage power has been disconnected. For this reason, always check for the presence of high voltage after disconnecting 12V and high voltage power before starting a repair that might involve contact with a high voltage component or cable.

 **WARNING:** Do not assume that the high voltage system is de-energized after 12V power and high voltage power have been disconnected. Always [check for high voltage](#) before proceeding with any repairs that involve contact with high voltage components.

 **WARNING:** When checking for the presence of high voltage, if any voltage reading is more than 10V, high voltage might be present. Due to the risk of electrocution, discontinue this procedure and contact a Tesla Service Center.



## High Voltage Components and Cables





## When and Where to Check for High Voltage

### When should you check?

Before any repair that involves contact with high voltage components or cables, always check for the presence of high voltage after disconnecting 12V and high voltage power (refer to the "[Location of High Voltage Components and Cables](#)" section of this document for more information).

### Where should you check?

Perform the steps in the "[Checking for High Voltage](#)" section of this document.

-  **WARNING:** Do not assume that the high voltage system is de-energized after 12V power and high voltage power have been disconnected. Always [check for high voltage](#) before proceeding with any repairs that involve contact with high voltage components.
-  **WARNING:** If any voltage is above 10V, do not proceed with a repair that might involve contact with high voltage components. Contact a Tesla Service Center for further instructions. Failure to follow this instruction could result in exposure to shock hazard.



## Disconnecting 12V and High Voltage Power

1 From the touchscreen, touch the **Open** button that corresponds to the front trunk.

2 Make sure that the climate control system is turned off.



## Disconnecting 12V and High Voltage Power

3 Fully lower the driver's window, and lower the remaining windows slightly.



**WARNING:** If the 12V power supply is disconnected, do not attempt to open a door with the door glass in a closed position. Failure to follow this instruction could result in door glass shatter.

4 Open both rear doors.



## Disconnecting 12V and High Voltage Power

5

Adjust both front seats to a fully upright position for access.

6

From the touchscreen, touch **Controls** > **Safety & Security** > **Power off** to turn off vehicle power.



## Disconnecting 12V and High Voltage Power

7

Remove the rear underhood apron.



8

Disconnect the 12V battery ground connection. Cover the terminal with insulating material to prevent accidental electrical contact between the terminal and the post.



**WARNING:** If the 12V power supply is disconnected, do not attempt to open the front doors with the door glass in closed position. Failure to follow this instruction could result in door glass shatter.



**NOTE:** Before disconnecting 12V power, make sure that the driver's door window is fully open. Failure to follow this instruction could result in vehicle lockout.





## Disconnecting 12V and High Voltage Power

9 Remove the 2nd row lower seat cushion.

A Move the two levers at the front of the 2nd row seat cushion to the left-hand side to release the cushion from the body.



B Raise the front of the cushion and pull it up.





## Disconnecting 12V and High Voltage Power

- 9 Remove the 2nd row lower seat cushion (continued).
- C Disconnect the harness connectors on each side of the cushion.



- D Remove the cushion from the vehicle.
-  **NOTE:** Pass the seat belt buckles through the cushion as the cushion is removed from the vehicle.





## Disconnecting 12V and High Voltage Power

10

Release the high voltage controller harness connector on the right side of the high voltage component enclosure to disconnect high voltage power.



**WARNING:** Make sure to release the correct connector. Do not attempt to remove any high voltage connectors with orange cables.



**NOTE:** The high voltage enclosure is also referred to as the "penthouse".





## Disconnecting 12V and High Voltage Power

11

Wait at least 2 minutes for all electrical circuits to fully discharge before continuing.



**WARNING:** Make sure that the high voltage power has been disconnected for at least 2 minutes before continuing. Failure to follow this instruction could result in serious injury or death due to exposure to high voltage.

12

If the repairs involve touching or working around high voltage system components, follow the steps in the "[Checking for High Voltage](#)" section of this document to check for the presence of high voltage.



**WARNING:** Do not assume that the high voltage system is de-energized after 12V power and high voltage power have been disconnected. Always [check for high voltage](#) before proceeding with any repairs that might involve contact with high voltage components.



**NOTE:** Refer to the [Location of High Voltage Components and Cables](#) section of this document for more information on the location of high voltage system components.



## Disconnecting 12V and High Voltage Power

- 13 After the repair is complete, [reconnect 12V and high voltage power](#).



## Checking for High Voltage

After disconnecting 12V and high voltage power, use this procedure to check for high voltage.

- 1 Remove the two bolts that secure the penthouse probe cover (circled in yellow) on the left side of the penthouse.



**NOTE:** The penthouse probe cover bolts require a 5-lobe (pentalobe) Torx socket available from Tesla (part number 1059330-00-B).



**NOTE:** This part number was current at the time of publication. Use the revision listed or later, unless otherwise specified in the Parts Manual.





## Checking for High Voltage

2

Put on proper personal protective equipment (PPE) and insulating high voltage gloves with a minimum rating of class 00 (500V).



**WARNING:** Proper personal protective equipment (PPE) and insulating high voltage gloves with a minimum rating of class 00 (500V) must be worn while performing the remainder of this procedure.



**WARNING:** Before each use, test gloves for leaks using a glove tester and verify that the testing date on the gloves has not expired (high voltage gloves can be used up to 12 months after the testing date printed on the glove, but only 6 months after first use even if the gloves are still within the 12 month period).

3

Remove the penthouse probe cover.





## Checking for High Voltage

4

Use the penthouse casing as a chassis ground. Measure the voltage at the locations listed below and verify that no high voltage is present:

- B+ to chassis ground
- B- to chassis ground
- B+ to B-



**WARNING:** Use a multimeter that meets CAT III or CAT IV ratings and has test probes that have no more than 3 mm of exposed tip. Both multimeter and test probes must be able to handle at least 500V.



**WARNING:** Use test probes that are thin enough to fit into the testing ports (less than 10-1/2 mm in diameter) and long enough to make contact with the terminals (at least 45 mm). The Fluke TP38, the Fluke TP80, and the Reed FC-170A are all suitable test probes.



**WARNING:** Make sure to insert the probes until they make contact with the terminals. If the probes do not make adequate contact with the terminals, the voltage readings might not be accurate and there might be a risk of electrocution.



**WARNING:** If any voltage reading is more than 10V, high voltage might be present. Due to the risk of electrocution, discontinue this procedure and contact a Tesla Service Center.



**NOTE:** The red arrow on the right side of the first image points to the front of the vehicle.



**TIP:** Check chassis ground in 2 locations for each measurement that uses chassis ground.



1 B+

2 B-



## Checking for High Voltage

- 4 Use the penthouse casing as a chassis ground. Measure the voltage at the locations listed below and verify that no high voltage is present (continued).



- 5 Reinstall components that were removed for access.



**NOTE:** Reinstallation is the reverse of removal, except for the following:

- Install a new penthouse probe cover seal and breather valve.
- Replace any missing butyl from the bolts that attach the penthouse probe cover to the penthouse before reinstalling them.
- Torque the bolts (x2) to 6 Nm (5 ft lb).



## Reconnecting 12V and High Voltage Power

Reconnecting is the reverse of disconnecting, except for the following:

- Press the loops at the front of the rear seat cushion into the receptacles.
- Torque the 12V battery ground connection to 10 Nm.
- Replace any broken clips.



**CAUTION:** Make sure to reconnect the high voltage controller harness connector before reconnecting 12V power. Reconnecting 12V power before reconnecting the high voltage controller harness connector might result in the high voltage battery becoming over discharged.